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**בקשה לפטנט**  
Application For Patent

אני, (שם המבקש, מענו ולגבי גוף מאוגד – מקומות ההתאמודות)  
I, (Name and address of applicant, and in case of body corporate-place of incorporation)

טכנולוגיות אינק ג'ט ועשויות (2003) בע"מ, חברת ישראלית מרוח' הרכבת 27, ירושלים 93502, ישראל  
Industrial Ink Jet Technology (2003) Ltd., Israel Company of 27 Harakevet Street, Jerusalem 93502,  
ISRAEL

שםהו ששמתו הוא  
Right of Law  
of an invention the title of which is

הדין  
by virtue of

שימוש בדיודות אורGANIC LIGHT EMITTING DIODES פולטות אור ליצירת חלונות צבעוניים

(בעברית)  
(Hebrew)

Use of Organic Light Emitting Diodes to Create "Stained Glass" Effects

(באנגלית)  
(English)

Hereby apply for a patent to be granted to me in respect thereof.

מבקש בזאת כי ניתן לי עליה פטנט

בקשת חילקה Application of Division		בקשת פטנט מוסף Appl. for Patent of Addition		דרישות דין קידימה Priority Claim		
מבקש פטנט from application	No.	בקשה/פטנט to Patent/Appl.	No.	מספר/סימן Number/Mark	תאריך Date	מדינת האיחוד Convention Country
Dated	מ"ס	Dated	מ"ס			
P.o.A.: General filed in our file 151332-4	• ייפוי כח: כללי הוגש בתיקנו 4-151332					
המען למסירות מסמיכים בישראל Address for Service in Israel						
C. 151333.2						
REINHOLD COHN AND PARTNERS Patent Attorneys P.O.B. 4060, Tel-Aviv						
תתיימת המבקש Signature of Applicant בשם המבקשים, ריינהולד כהן ושותפיו ע"י: -						
2004 January 8 This Year of the day						
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**שימוש בדיזוזות אורGANIC POLYMER LIGHT EMISSION**

**Use of Organic Light Emitting Diodes to Create "Stained Glass" Effects**

**Industrial Ink Jet Technology (2003) Ltd.**

**טכנולוגיות אינק ג'ט תעשייתיות (2003) בעמ'**

**C. 151333.2**

## ● Use of organic Light Emitting Diodes to Create "Stained Glass" Effects

### Field of the invention

This invention relates to Organic Light Emitting Diodes (OLED) and to decorative stained glass such as used in windows.

### Background of the invention

Colored glass was used since ancient times in Europe and the Far East for decorations on buildings where small pieces of glass were embedded in structural elements of stone and wood, or in floors in the form of mosaics. When buildings started to have windows, and larger pieces of glass were available, a new art emerged. The colored glass pieces were combined together, using lead frames to hold them. Pieces were combined together so that they could fill the total area of a window, creating thus a colored, patterned windows.

The mastering of this art was made possible by two developments- the ability to cut flat glass pieces into desired size and shapes, and the ability to stain the glass with desired colors. In the initial phase of the art, the colors were fired into individual pieces, each having a single color. Later the technique allowed painting details with other colors on the cut to shape glass pieces, therefore creating picturesque elements that were used as building blocks to be combined to fill the window frame and create a translucent picturesque window. The individual pieces were held together by strips of lead that were then joined by heating the lead and therefore joined at the borders of the glass pieces. This process allowed the stained glass to become flat and to fit into a window frame. As this was a tedious and expensive process, such windows were mostly for churches and palaces.

A following phase of development occurred when the manufacturing of large size glass window panes was mastered. At this stage, there was no need to combine pieces and a whole glass pane could be stained artistically by colors and then fired, creating a full size, one piece stained glass. Such became more affordable as the major task was of painting the glass with the appropriate designs and colors. This technique was used as recently as the last century to create stained glass windows resembling the old art by artist such as Marc Chagall [ in the Synagogue of the Hadassah Hebrew University

hospital in Jerusalem ].

What should be noted is that the stained glass is translucent, and placing it in a window made the picture luminous by the light transmitted from the outside. This luminosity and translucency is a main attribute to the attractiveness of stained glass windows.

## Summary of the invention

Organic light emitting diodes [OLED] are substances that can be made to illuminate when electric current is passing through them. These OLED materials are placed on transparent substrate through which the luminescence is seen. The other side of the OLED device is usually opaque, covered by metallic electrode and a sealing layer. Normally used for display applications such as in computer screens and in displays of cellular telephones or PDA, observing the luminosity is done only from the transparent side of the device [ the substrate side] . In this cases having a transparent backing would be disadvantageous, as non related patterns can be seen through the display. The reason for this is that the OLED devices are made of few very thin layers, mostly in the orders of tenths of a micron. Thus for all practical reasons they are transparent to ambient light. The only layer that exceed a micron in thickness is the sealing layer.

The invention is of using OLED to create an OLED device which when illuminated by exciting current will give a visual experience of a stained glass windows. The colored pattern can be achieved by using conventional printing techniques as described in U.S. Patent Application No. 60/525,179 entitled "Method and system for patterning an organic light emitting diode display by printing" by the same inventors of the present application. Using this approach to create a patterned OLED on a glass substrate that will fit into a window frame, the visual perception of stained glass window can be achieved when current is passed through two electrodes as described in U.S. Patent Application No. 60/525,179.

However, when no electric current is available, and if the transparent OLED layers will be sealed by opaque sealing layer, the window will appear nearly blank with some tinting on it due to back reflected light.

The present invention devise means that can create the visual perception of

stained glass window during day light as well and without passing current through it. This can be achieved by making the OLED translucent, and by having the glass to appear as tinted sufficiently to create the stained glass window effect during daylight, without electrical excitation or with having the electrical excitation at a minimally desired level.

According to the invention, the OLED device will be seen as stained glass window during both day and night, though the effect will not be exactly the same in the two conditions. The invention proposes also means to increase the similarity during both periods.

The invention is not limited to the appearance of single piece stained glass windows, but also proposes means to create resemblance to the multi-piece ancient art [ where lead joints were used ] when such resemblance is desired.

### Detailed description of the invention

OLED devices are made of several layers, and the invention proposes how all these material can be used to create a translucent layer that will pass day light. For example, an OLED device using conjugated polymers as the light emissive layer can have the following structure:

1. A transparent glass or plastic material base layer [ the substrate ].
2. A nearly transparent anode made of Indium-Tin Oxide ( ITO ) as it is only 100 nm thick.
3. A hole ejection layer, 70 typically a nm thick coat of "PEDOT" (polyethylene-thioxothiophene) or similar material. This layer is also nearly transparent
4. An electron ejection layer, which is the luminescent layer, made of conjugated polymers or phosphorilated conjugated polymers. This layer is translucent but tinted. This luminescent layer can be made to illuminate in different colors, and the tint correspond to the color of illumination.
5. A cathode layer. This layer can be made nearly transparent by using extremely thin coats of conductive materials, including conductive polymers.
6. A sealing layer that can be made of UV curable materials which are also-transparent or can be made of glass bonded with the substrate glass by glass frit or glue or by anodic bonding.

Those familiar with the art will know that the above scheme of OLED layers can have several modifications, and that other combinations can be made to achieve a desired level of transparency.

Using the printing techniques described in U.S. Patent Application No. 60/525,179 by the same inventors of the present application, it is possible to create colored patterns that will resemble the visual effects of traditional stained glass windows. When day light in sufficient amount is available, no current will be passed through the device, and the tinted luminescent layer will act to have the device appear as a stained glass.

Under lack of sufficient daylight, or at night, current will be passed through the device and it will actively illuminate the colored pattern.

In order to equalize as much as possible the visual appearances during day and night, the voltage of the device will be controlled.

Those familiar with art know that the level of luminosity is a non linear function of the voltage applied to the device.

Such control while can be left as manual control, or can be done as a programmable servo mechanism. The two electrodes will be connected to the power source through a voltage level controller. This controller will receive an input from a photo sensor that will measure the out side light-level, and its input will serve to increase or decrease the voltage to the desired level by firmware included in the controller.

In order to create perceptual resemblance to the ancient stained glass art where colored glass pieces were held together by lead strips and joint, the present invention propose to imitate such lines by printing them with black resin. using ink jet or lithographic processes.

### Description of the figures

Figure 1 depict one example of constructing the layers of OLED so that the OLED device is nearly transparent.

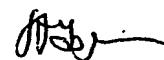
Figure 2 is a schematic drawing of patterning an OLED device used in stained glass application that appears as a single piece of glass with different colors at different places.

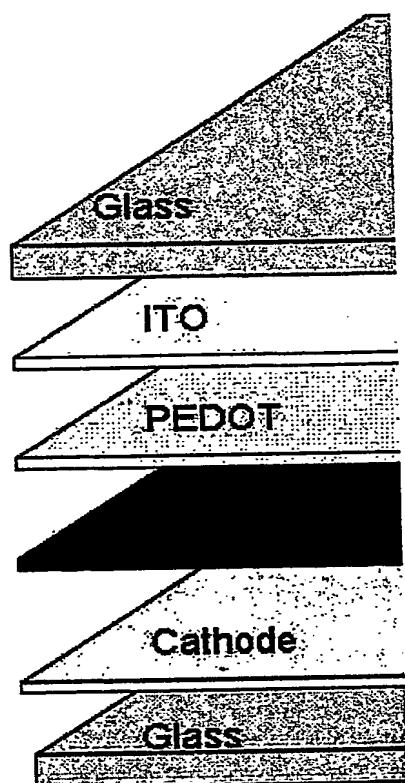
Figure 3 is same as figure 2 except that the different colored areas are demarcated by heavy black lines [ using black resin for example. This configuration resemble multi piece stained glass where the pieces are joined by lead strips.

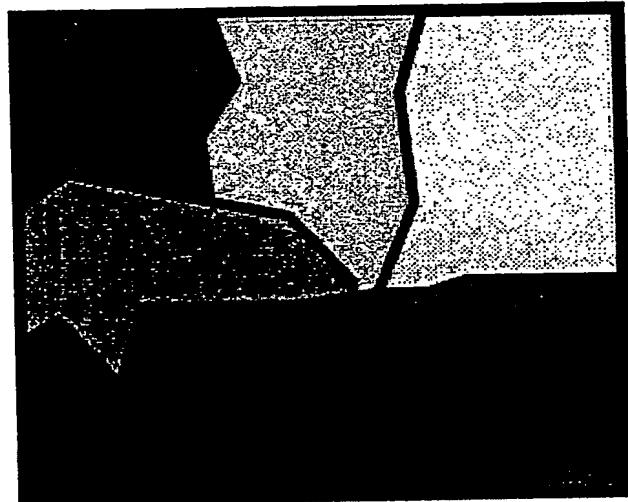
## **Claim**

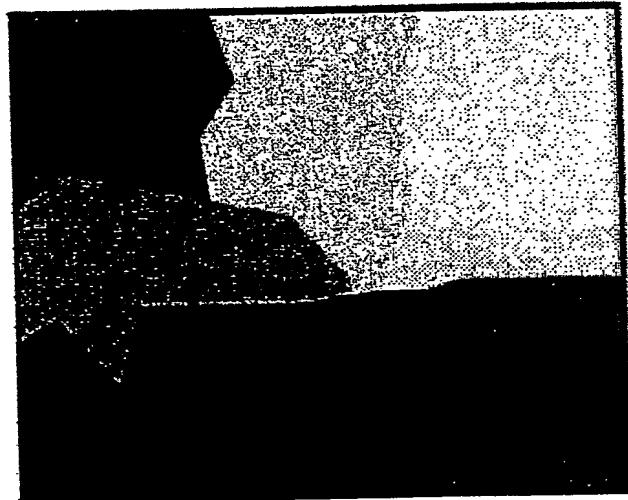
**An Organic Light Emitting Diode that act as a stained glass, substantially as described herein with reference to the drawings.**

**For the Applicants  
REINHOLD COHN AND PARTNERS  
By:**









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